# RECOIL-ION DETECTION SYSTEM

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Experiment CE06, "Measurement of Nuclear Reactions Using Recoil Detection," is being set up in the T-section of the ring, where the magnet that bends the primary beam 6° sweeps the recoils into a detection system. A schematic of the experimental layout is shown in Fig. 1. The particles first pass through a parallel grid avalanche counter (PGAC)

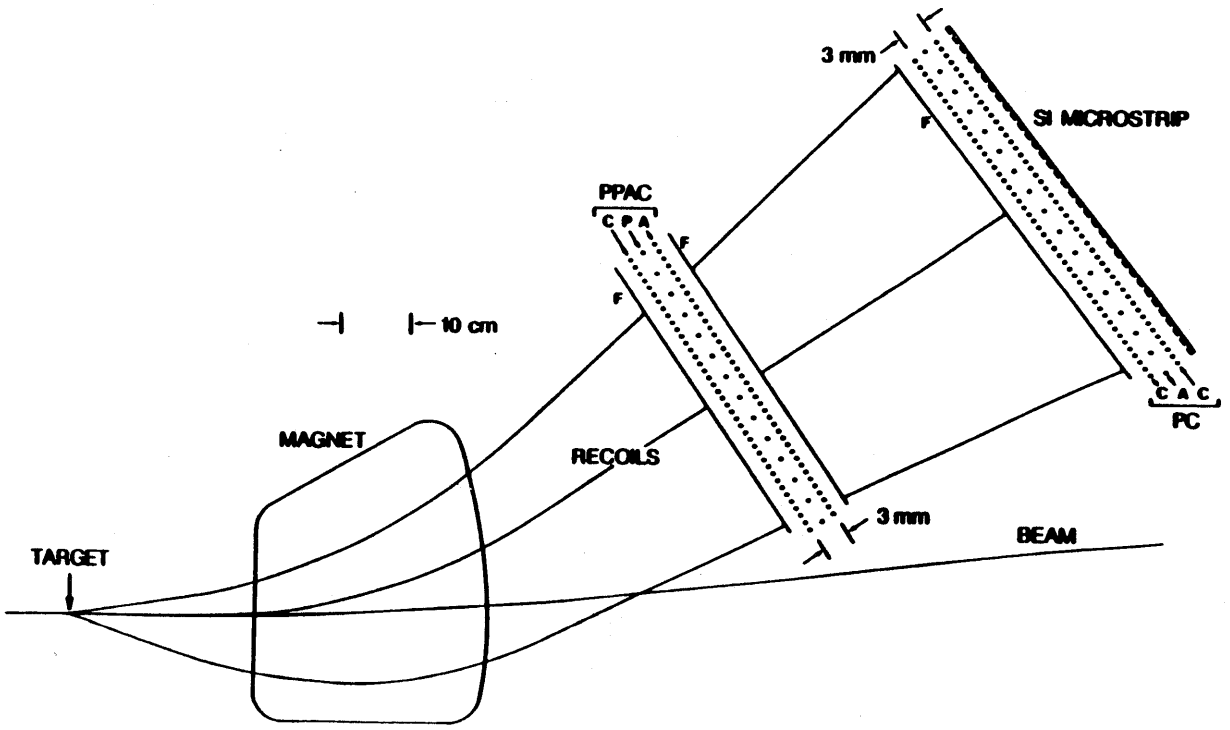


*Figure 1.* Layout, not to scale, of experiment CE06.

which measures the time and position of the particles emerging from the magnet. The PGAC has 0.9-micron entrance and exit foils and has a time resolution of 600 ps. After traversing a 50-cm flight path, the recoils pass through a proportional counter (PC which measures dE/dx. Position, time, and energy information will be obtained from an array of silicon microstrip detectors which are mounted in the same housing as the PC.

Each microstrip detector is made up of 50 strips 5 cm long and 1 mm wide. A readout scheme has been developed in which inductors are placed between each strip, thus forming a delay line, and the time difference between the two ends indicates the position of the event along the detector. The circuitry is shown in Fig. 2 and a time spectrum taken with 5.4 MeV alpha particles is shown in Fig. 3, where it can be seen that every strip is cleanly resolved. The time resolution is about 1 ns for 5.4 MeV alphas, and the energy signal is taken off the back.

An alternate readout scheme has been developed in which the signal from each strip is amplified and passed through a discriminator. The SMD printed circuit board technique has been used to develop a small size, low cost, low power system which can, if necessary, be run in vacuum. Each strip is unambiguously identified and a time resolution of 1.5 ns was achieved with 5 MeV alphas.

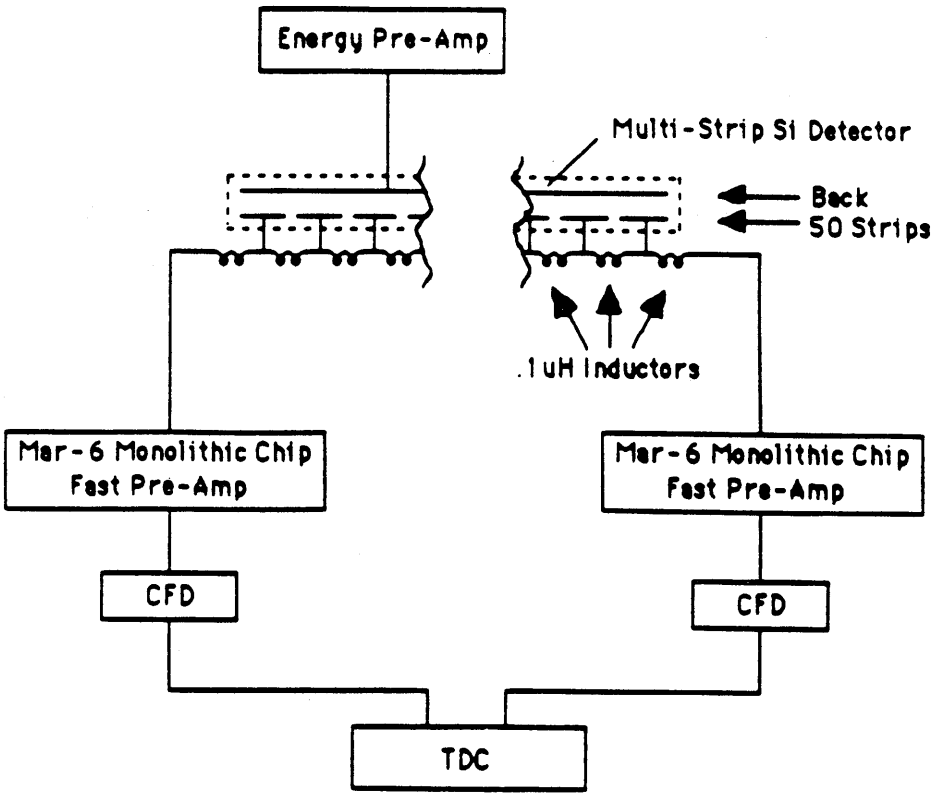


*Figure 2.* Schematic of readout of Si microstrip detectors.

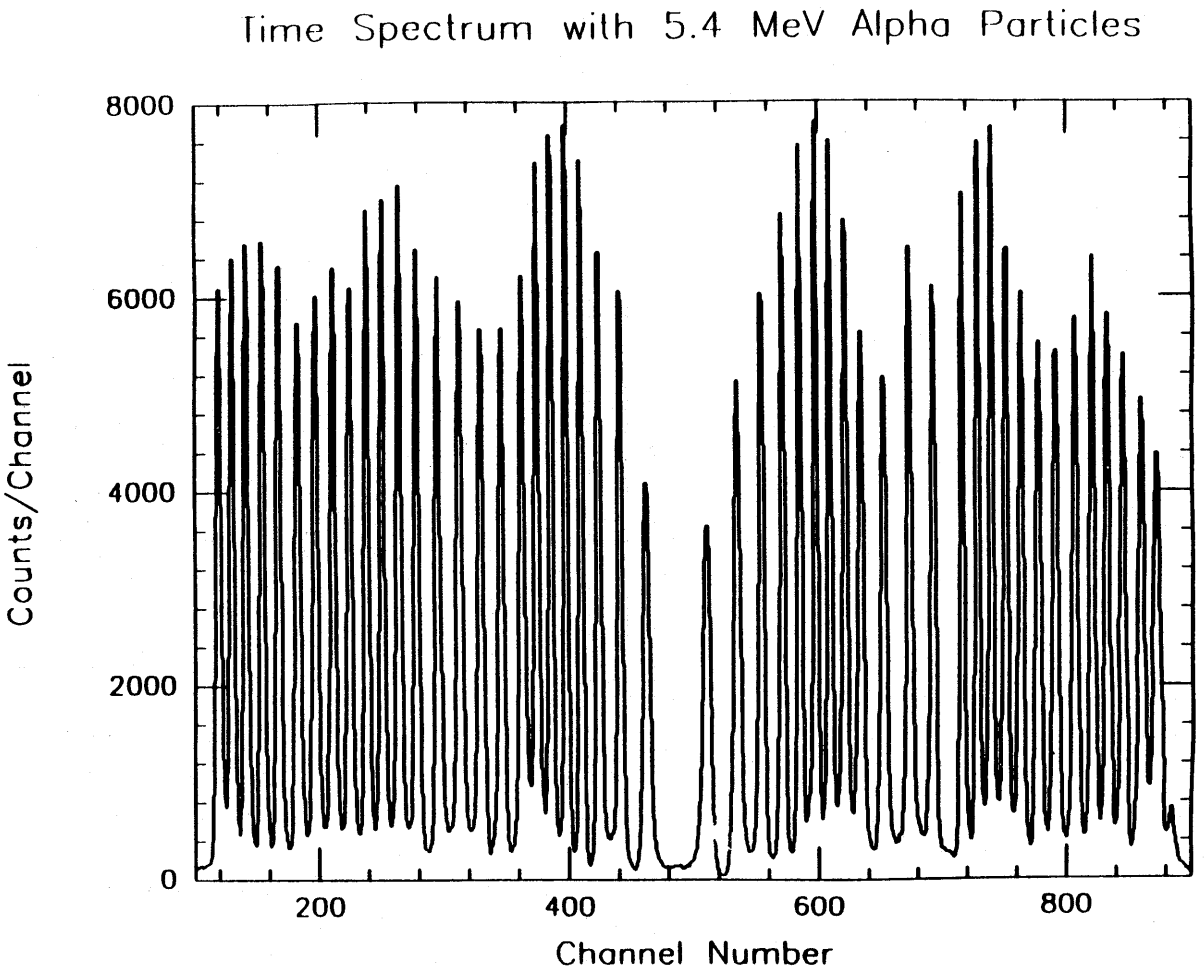


*Figure 3.* Time difference spectrum, in arbitrary units, between the two ends of a Si microstrip detector, using the circuitry shown in Fig. 2. The spectrum was taken with 5.4 MeV alpha particles.